

ARCHDIOCESE OF DENVER CATHOLIC SCHOOLS

TABLE OF CONTENTS 2018 Math Standards

INTRODUCTION	2
COMMITTEE MEMBERS.....	3
PHILOSOPHY	4
STANDARDS	5-52
PRESCHOOL - PRE-KINDERGARTEN	5
KINDERGARTEN.....	7
1 ST GRADE	9
2 ND GRADE	12
3 RD GRADE	16
4 TH GRADE.....	19
5 TH GRADE.....	22
6 TH GRADE.....	25
7 TH GRADE.....	28
ALGEBRA I	30
GEOMETRY	35
ALGEBRA II	39
PROBABILITY AND STATISTICS	43
PRE-CALCULUS	45
OTHER COURSES.....	49
SCOPE & SEQUENCE	52
TEXTBOOK RECOMMENDATIONS	62

INTRODUCTION

2018 Math Standards

The Mathematics Standards Review Committee began their work in the 2016-2017 school year and continued working through the 2017-2018 school year. The goal of the committee was to review the quality standards document written and revised by previous standards committees who served the archdiocese. The committee overwhelmingly agreed that the 2018 work began with a solid foundation and their main goals were to clarify language and help to make the document as easy-to-use as possible.

The committee operated from some guiding foundational ideas that the committee found particularly important from the 2010 Math Curriculum Guidelines document:

Teachers should be very familiar with the new curriculum guide. It is the intention of the curriculum committee that teachers be held accountable for the objectives in this guideline and not necessarily for the contents of an entire textbook. The challenge, then, is to understand what the Archdiocese of Denver Catholic Schools considers important and teach those concepts well regardless of the content of the textbook. The recommendations of the committee in the Textbook Recommendation document point to series that support the objectives well, but there is no one series that does so perfectly.

The committee felt strongly that written standards are important, but perhaps most important for the fidelity of their implementation is the professional development of teachers, and the instructional leadership of principals in leading school-wide vertical analysis processes and holding teachers accountable to a rigorous bar of mathematics course content. It is highly recommended that schools provide professional development in teaching Math. The publishers whose series have been recommended by the committee provide various levels of staff development opportunities—many online resources and additional print resource materials. Many schools have excellent elementary teachers who could coach or mentor insecure teachers in neighboring schools or clusters of schools. A “Math specialist” may be an option for some schools, or sharing instruction responsibilities among teachers—the 2nd grade teacher would teach both 2nd and 3rd grade Math and the 3rd grade teacher would teach both 2nd and 3rd grade Social Studies.

For this change to have the success we envision, support and professional development opportunities must be provided for teachers of Math at every level so that they have the skills they need and can assist their students to meet these challenging goals.

The committee also came to a unanimous decision that to make a usable document would be to accompany the standards with a resource list in how these standards could be accomplished. The resource document can be found at the end of this standards document.

The committee intends for the document to be used as the following: the scope and sequence document provides a high-level look at when skills are introduced and mastered, then the standards list includes what those specific skills are within the scope and sequence breakdown, and finally, the resource document gives ways to meet those standards.

Most important to our work was the committee’s desire and principals’ desire to include a distinctly Catholic lens to our Math standards—that our standards are ordered toward the goal of Catholic education which is to form students in mind, body, and soul. Catholic education seeks to know and understand objective reality, including transcendent Truth, which can be understood through faith and reason, and finds its origins and end in God. As a result, we recommend a school-based vertical articulation process unpacking the Catholic dispositions included in the standards, as well as a school-based conversation on the Philosophy document that follows, including the references to the referenced Church documents, so that teachers can best help form their students in those dispositions.



Many thanks to the members of the 2018 Math Standards Revision Committee.

Committee Members:

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PHILOSOPHY

2018 Math Standards

Unique in the order, precision, and unity of its structure, mathematics reflects the order and unity in God’s universe. The study of mathematics is an important function in achieving the goals of Catholic education. Catholic education involves the formation of the whole person—body, mind, and spirit, in light of the student’s ultimate end.¹ Catholic education seeks to know and understand objective reality, including transcendent Truth, which can be understood through faith and reason, and finds its origins and end in God.²

The preschool through high school mathematics program in the Catholic schools of the Archdiocese of Denver is designed to form students who conjecture, reason logically, and communicate mathematically. Students will attain skills in basic number operations and use a variety of mathematical methods and appropriate technology to solve problems and function confidently in a mathematically sophisticated and increasingly complex world. They will exhibit this confidence with or without the use of technology.

Certain dispositions are integral to mathematics instruction in the Archdiocese of Denver. Teachers must help develop in all students the confidence that they are capable of understanding mathematics. Teachers are responsible for fostering a culture of learning, in which lessons are prepared towards the end of student mastery of material. Teachers should work to help students develop the natural virtues of self-discipline and fortitude. Students should be supported in displaying a wonder about mathematical relationships, a joy in solving difficult mathematical problems, and a stimulated response to the beauty, harmony, proportion, radiance, and wholeness present in mathematics, “The light of Christian faith stimulates a desire to know the universe as God’s creation. It enkindles a love for the truth that will not be satisfied with superficiality in knowledge or judgment. It awakens a critical sense which examines statements rather than accepting them blindly. It impels the mind to learn with careful order and precise methods, and to work with a sense of responsibility. It provides the strength needed to accept the sacrifices and the perseverance required by intellectual labour.”³

Basic to our belief as Catholic school educators is the awareness of the capacity of the mind to discover, to uncover truth, to assimilate facts, to draw and define relationships between all that is in creation. The mathematics curriculum encompasses and embodies this basic belief in development of curriculum and methodologies of learning.

¹ [The Catholic School, 1977, #36, 47, 49. Gravissimum Educationis, 1965, #1, par. 1](#)

² [Fides et Ratio, 1998](#)

³ [The Religious Dimension of Education in a Catholic School, 1988, #49](#)

2018 Math Standards

PRESCHOOL – PRE-KINDERGARTEN

(Page 1 of 2)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Count orally from 1 to 10.
2. Touch and count objects from 1 to 10 (one-to-one correspondence).
3. Recognize and write numerals 1 to 10.
4. Locate whole numbers on a number line from 1 to 10.
5. Equate "zero" as a quantity of nothing.
6. Guess the number of objects before counting.
7. Recognize and create a group of a given number of objects up to 10.
8. Compare quantities or groups of objects as "bigger or smaller".
9. Recognize ordinal numbers (1st, 2nd, 3rd).

B. Addition and Subtraction

The student will:

1. Use concrete objects to perform addition and subtraction with sums and differences up to 10.

C. Multiplication and Division – no objectives

D. Properties

The student will:

1. Understand that adding zero does not change a number (Identity Property of Zero).

E. Fractions, Decimals, Percentages, and Ratios – no objectives

PRESCHOOL – PRE-KINDERGARTEN

(Page 2 of 2)

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Compare objects by length, weight, and capacity (longer/shorter, heavier/lighter, more/less, or the same).

B. Time

The student will:

1. Recognize a clock and a calendar as measures of time.
2. Choose appropriate units of time (night/ day, morning/afternoon, yesterday, today, tomorrow, day/week/month).

C. Money – no objectives

III. GEOMETRY

The student will:

1. Describe the location of an object (top/ bottom, over /under, outside /inside).
2. Identify basic shapes (circle, square, triangle, rectangle, diamond).
3. Sort objects by shape, color, size, and weight.
4. Draw basic shapes without a pattern.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS – no objectives

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Identify an object that does not belong in a specific group.
2. Classify one set of objects in multiple ways (classify as baby animals and adult animals, or farm animals and zoo animals).
3. Recognize and duplicate simple patterns (ABAB, rhymes, and songs).

KINDERGARTEN

(Page 1 of 2)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Count orally to 100.
2. Skip count to 100 by tens.
3. Count backwards from 10 to 0.
4. Touch and count objects from 1 to 10 (one-to-one correspondence).
5. Recognize, read, and write numbers from 0 to 30.
6. Locate and order whole numbers with or without a number line from 0 to 30.
7. Equate "zero" as a quantity of nothing.
8. Guess the number of objects before counting.
9. Recognize and create a group of a given number of objects up to 30.
10. Compare quantities or groups of objects as "more than, less than, equal to."
11. Recognize ordinal numbers (1st, 2nd, 3rd... to 10th).
12. Identify odd and even numbers up to 10.

B. Addition and Subtraction

The student will:

1. Use concrete objects to solve problems with sums and differences up to 20.
2. Fluently add and subtract up to 10.

C. Multiplication and Division – no objectives

D. Properties

The student will:

1. Recognize and use the identity property of zero (adding or subtracting zero doesn't change a number).
2. Recognize and use the commutative property of addition: $2 + 1 = 1 + 2$

E. Fractions, Decimals, Percentages, and Ratios

1. Identify one whole, halves, thirds, and fourths.

KINDERGARTEN

(Page 2 of 2)

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Compare objects by length, weight, and capacity (longer/shorter, heavier/lighter, more/less, or the same).
2. Select appropriate tools for measuring various objects.
3. Add and subtract measurements of the same unit: $1 \text{ ft.} + 1 \text{ ft.} = 2 \text{ ft.}$

B. Time

The student will:

1. Recognize a clock and a calendar as measures of time.
2. Choose the appropriate units of time (night/day, morning/afternoon; today /tomorrow /yesterday; day/week/month).
3. Recite the 7 days of the week and the 12 months of the year in order.
4. Identify each hour on an analog clock.

C. Money

The student will:

1. Identify coins and their values (penny, nickel, dime, quarter).
2. Use the cent sign.

III. GEOMETRY

The student will:

1. Identify two- and three-dimensional shapes by name (square, circle, rectangle, triangle, oval; cube, cylinder, sphere, cone, pyramid, and rectangular prism).
2. Demonstrate relative spatial terms and show examples: inside, between, about, below, behind, near to, left, right, etc.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Collect data about themselves and their surroundings (hair color, eye color, shoe color, birthdays).
2. Construct and interpret graphs (pictographs and bar graphs).

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Classify and sort objects according to their attributes and describe classifying rules (shape, size, color).
2. Recognize, create, duplicate, and continue patterns using objects.

1ST GRADE

(Page 1 of 3)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Skip count to 120 by 2, 5, and 10.
2. Count backwards from 100 to 0.
3. Recognize, read, and write numbers from 0 to 100.
4. Locate and order whole numbers with and without a number line from 0 to 100.
5. Estimate a number's location on a number line up to 100.
6. Compare quantities or groups of objects as "more than, less than, equal to" using symbols ($>$, $<$, $=$).
7. Recognize and create a group of a given number of objects up to 100 using base-ten blocks.
8. Recognize ordinal numbers (1st, 2nd, 3rd... to 10th).
9. Identify odd and even numbers up to 100.
10. Recognize two-digit numbers as groups of tens and ones (place value).
11. Compute from left to right when using addition and subtraction: $4 + 2 - 5 + 3 = 4$
12. Create equivalent representations of given numbers (such as 15 represented by 1 ten and 5 ones, or 15 ones; 25 represented by 25 ones, 2 tens and 5 ones, or 1 ten and 15 ones).

B. Addition and Subtraction

The student will:

1. Use concrete objects, length-based models, and number lines to illustrate addition and subtraction.
2. Use strategies to generate basic facts and to demonstrate understanding of the inverse relationship between addition and subtraction (doubles, plus-minus-one, making 10, fact families, counting on, etc.).
3. Add and subtract two-digit numbers with and without regrouping.
4. Fluently add and subtract numbers up to 20.
5. Choose the appropriate operation of addition or subtraction in word problems.

C. Multiplication and Division – no objectives

1ST GRADE

(Page 2 of 3)

D. Properties

The student will:

3. Master the use of the identity property of zero (adding or subtracting zero doesn't change a number).
4. Use the commutative property of addition: $2 + 3 = 3 + 2$
5. Use the associative property of addition: $(7 + 9) + 1 = 7 + (9 + 1)$
6. Use transitive properties:
 - a. Equality: "If Elizabeth is the same height as Joe and Joe is the same height as Brad, then Elizabeth is the same height as Brad."
 - b. Inequality: "If Elizabeth is shorter than Joe and Joe is shorter than Brad, then Elizabeth is shorter than Brad."
5. Identify inverse operations of addition and subtraction: $6 + 10 - 10 = 6$
6. Use the commutative and associative properties to solve addition problems mentally.

E. Fractions, Decimals, Percentages, and Ratios

1. Identify simple, unit fractions (1 whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$) using models and pictures.

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Estimate, measure, compare, and order length using standard (centimeters, meters, inches, feet, and yards) and non-standard units.
2. Select appropriate tools for measuring various objects.
3. Use different nonstandard units to measure the same object (my desk is five pencils tall; it is also three books tall).

B. Time

The student will:

1. Read and identify dates and days of the week using a calendar.
2. Master ordering days and months.
3. Tell time to the hour and half-hour using an analog clock.
4. Compute elapsed time to the hour.

C. Money

1. Identify coins and their value including half-dollars and dollar coins.
2. Add total value of mixed coins: pennies, nickels, dimes.
3. Use the cent sign.

1ST GRADE

(Page 3 of 3)

III. GEOMETRY

The student will:

1. Identify and describe characteristics of two-dimensional and three-dimensional shapes (square, circle, rectangle, triangle, oval, pentagon, hexagon, octagon; cube, cylinder, sphere, cone, pyramid, and rectangular prism).
2. Draw squares, circles, rectangles, triangles, ovals, and pentagons.
3. Compare and contrast characteristics of the above geometric shapes.
4. Compose (combine) and decompose (take apart) composite shapes.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Use tally marks to collect and organize data.
2. Construct and interpret picture and bar graphs.
3. Use words like more and less to draw conclusions about data.

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Classify and sort objects according to their attributes and describe classifying and sorting rules (shape, size, color).
2. Recognize, create, duplicate, and continue patterns (including growing patterns) using objects.
3. Recognize, create, duplicate, and continue patterns using numbers.
4. Use mental math to find missing numbers or operational signs with addition and subtraction.
5. Defend an answer using objects or logical argument.

2ND GRADE

(Page 1 of 4)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Skip count by 2, 5, 10, 25, 100, and 1000.
2. Recognize, read, and write numbers from 1 to 1,000 in standard, expanded, and word form.
3. Locate and plot whole numbers on a number line from 1 to 1,000.
4. Use a number line to round numbers to the nearest ten or hundred.
5. Compare quantities or groups of objects as “more than, less than, equal to” using symbols ($>$, $<$, $=$).
6. Identify any number as odd or even by looking at the digit in the ones place.
7. Order numbers up to 1,000.
8. Identify place value of ones, tens, hundreds, and thousands.
9. Compute from left to right when using addition and subtraction: $4 + 2 - 5 + 3 = 4$
10. Create equivalent representations of given numbers (such as 35 represented by 35 ones, 3 tens and 5 ones, or 2 tens and 15 ones; 325 represented as 2 hundreds, 12 tens, and 5 ones).

B. Addition and Subtraction

The student will:

1. Use concrete objects, length-based models, and number lines to illustrate addition and subtraction.
2. Use mental math strategies to generate basic facts and to demonstrate understanding of the inverse relationship between addition and subtraction (doubles, plus-minus-one, making 10, fact families, counting on, tens first, etc.).
3. Master addition and subtraction facts to 20.
4. Add and subtract up to four-digit numbers with regrouping.
5. Subtract across zeros of three-digit numbers.
6. Choose the appropriate operation of addition or subtraction in word problems.
7. Estimate sums and differences of numbers up to 1,000.

C. Multiplication and Division

1. Use repeated addition as a model for multiplication.
2. Use repeated subtraction and splitting into equal groups as a model for division.
3. Demonstrate fluency of multiplication facts (2s, 5s, and 10s).

2ND GRADE

(Page 2 of 4)

D. Properties

The student will:

1. Master the commutative property of addition: $2 + 3 = 3 + 2$
2. Master the associative property of addition: $(7 + 9) + 1 = 7 + (9 + 1)$
3. Use transitive properties:
 - a. Equality: $20 + 9 = 29$; $30 - 1 = 29$; therefore, $20 + 9 = 30 - 1$ (mental math application).
 - b. Inequality: "If Elizabeth is shorter than Joe and Joe is shorter than Brad, then Elizabeth is shorter than Brad."
4. Master the inverse operations of addition and subtraction: $6 + 10 - 10 = 6$.
5. Use the identity property of one for multiplication: $7 \times 1 = 7$ (no algorithm used).
6. Identify inverse operations of multiplication and division.

E. Fractions, Decimals, Percentages, and Ratios

1. Identify unit and simple fractions (1 whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{4}$) using models, pictures, and a number line.
2. Compare and order simple fractions (1 whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$) using models, pictures, and a number line.
3. Recognize equivalent fractions of $\frac{1}{2}$ and 1 whole.
4. Identify decimals as a part of a whole exclusively with money.
5. Write decimals to hundredths exclusively with money.
6. Add and subtract decimals exclusively with money.

2ND GRADE

(Page 3 of 4)

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Use appropriate measurement tools (rulers, yardsticks, and meter sticks).
2. Estimate, measure, add, and subtract lengths customary and metric units (inches, feet, yards, centimeters, and meters).
3. Partition lengths into equal-sized segments.
4. Estimate, measure, add, and subtract weight using customary and metric units (ounces, pounds, grams).
5. Identify the relationship between inches and feet, centimeters, and meters.

B. Time

The student will:

1. Identify the relationship between units of time (365 days/year, 24 hours/day, 7 days/week, 60 minutes/hour, 60 seconds/minute).
2. Read and write time using an analog clock in five-minute increments.
3. Describe time as A.M. or P.M., noon, or midnight.
4. Add similar units of time (3 hours + 2 hours).
5. Compute elapsed time in half hour increments.

C. Money

The student will:

1. Identify, count, and write values of coins and bills.
2. Add total value of mixed coins; pennies, nickels, dimes, quarters, half-dollars (sums less than \$1), dollars coins and dollar bills.
3. Make change within \$1.00.
4. Use the dollar and cent sign appropriately.

2ND GRADE

(Page 4 of 4)

III. GEOMETRY

The student will:

1. Describe characteristics of three-dimensional geometric solids to include cubes, rectangular prisms, pyramids, spheres, cylinders, and cones using the terms faces, edges, and vertices.
2. Compare and contrast the properties of two-dimensional plane figures (circle, triangle, rectangle, square, oval) and three-dimensional solids (cube, cylinder, sphere, cone, pyramid, and rectangular prism).
3. Identify the lines of symmetry for various shapes (letters of the alphabet, triangles, circles, etc.).
4. Identify and define congruent shapes.
5. Identify horizontal and vertical lines.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Collect and organize data in tally charts and frequency tables.
2. Represent, construct, and interpret data in pictographs, scaled pictographs, and bar graphs.
3. Understand, predict, and represent probability in words (impossible, less likely, equally likely, more likely, and certain).

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Recognize, create, and continue patterns using objects.
2. Recognize, create, continue, and solve problems with patterns using numbers.
3. Use mental math to find missing numbers or operational signs with addition and subtraction.
4. Find the missing number in an addition or subtraction problem.
5. Defend an answer using objects or logical argument.

3RD GRADE

(Page 1 of 3)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Master counting forward, counting backward, and skip counting by 2 - 10, 25, 50, 100, 1000.
2. Understand and identify place value to 100,000.
3. Recognize, read, and write numbers in standard form, expanded form and word form.
4. Estimate and round numbers.
5. Compare and order numbers to 100,000 using $<$, $>$, and $=$.
6. Identify Roman Numerals using I, V, and X.
7. Plot whole numbers on a number line.
8. Correctly use order of operations with addition and subtraction.

B. Addition and Subtraction

The student will:

1. Use various models to illustrate addition and subtraction. Models can include objects, pictures, and number lines.
2. Add and subtract multi-digit whole numbers with regrouping including zeros.
3. Estimate sums and differences of whole numbers up to 100,000.

C. Multiplication and Division

The student will:

1. Use models to show that repeated addition and repeated subtraction are multiplication and division.
2. Use models to show multiplication and division by using arrays and rectangle models.
3. Demonstrate fluency with multiplication and division facts from 0 to 10.
4. Multiply whole numbers including multi-digit.
5. Multiply by powers of 10.
6. Write and understand the meaning of remainder: $12 \div 5 = 2 R 2$
7. Divide multi-digit whole numbers with zeros.
8. Introduce and understand divisibility rules of 2, 3, 4, 5, 6, 9, and 10.

3RD GRADE

(Page 2 of 3)

D. Properties

The student will:

1. Develop understanding transitive properties of equality/inequality.
2. Master the properties of zero and identity property of multiplication.
3. Develop and master the inverse operations of multiplication and division.
4. Begin to use the distributive property.
5. Use the commutative and associative property of multiplication.

E. Fractions, Decimals, Percentages, and Ratios

The student will:

1. Identify equivalent fractions and simplify fractions using models and number lines.
2. Recognize and write proper and improper fractions and mixed numbers.
3. Compare, order, and estimate fractions using models.
4. Identify decimals as part of a whole, using money as a model.
5. Write decimals using standard form, as words, and expanded notation.
6. Add and subtract decimals to hundredths.
7. Add and subtract fractions and mixed numbers with common denominators.
8. Compare and order decimals on a number line.
9. Round decimals to the nearest whole number.
10. Use decimals as fractions and simple fractions as decimals.
11. Model and demonstrate how to find multiples and factors.

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Choose and use appropriate units and tools for measuring weight, length, and capacity.
2. Read a customary ruler to the nearest $\frac{1}{4}$ inch.
3. Compute and convert measurements using basic units.
4. Begin using the concept of scale to find unknown measurements.

B. Time

The student will:

1. Understand and choose appropriate units of time.
2. Master reading and writing time to the nearest minute using an analog clock.
3. Compute elapsed time to the nearest minute.

C. Money

The student will:

1. Count and write amounts of money using bills and coins.
2. Add total value of mixed coins and dollar bills.
3. Make change using bills and coins.
4. Estimate and round to the nearest dollar.
5. Recognize that dollars and cents are decimals, and that money may be represented as fractions of dollars.
6. Add and subtract money amounts.
7. Use the cent and dollar sign appropriately.

3RD GRADE

(Page 3 of 3)

III. GEOMETRY

The student will:

1. Identify, describe, sort, and draw the following shapes: square, circle, rectangle, triangle, oval, pentagon, hexagon, octagon; cube, cylinder, sphere, cone, pyramid, and rectangular prism.
2. Identify, describe, and draw composites of the above shapes.
3. Calculate the perimeter of simple two-dimensional shapes.
4. Identify line symmetry of the above shapes.
5. Identify and draw congruent shapes.
6. Identify characteristics and relationships of lines (vertical, horizontal, intersecting, parallel, and perpendicular).
7. Identify angles as acute, obtuse, right, and straight.
8. Classify triangles as equilateral, isosceles, and scalene.
9. Identify, draw, and label lines, line segments, and rays.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Interpret and construct graphs including line plot, line graph, and bar graph.
2. Analyze and summarize data using mode and range.
3. Understand how to draw conclusions from data in line plots, line graphs, and bar graphs.
4. Understand and represent probability in words (impossible, less likely, equally likely, more likely, and certain).
5. Understand, predict, and represent probability in numbers, represented as a fraction.
6. Calculate probabilities of single events in a variety of situations (coin flips, rolling dice, spinners, and drawing cards).

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Recognize and duplicate sequential patterns with numbers.
2. Recognize and solve number patterns.
3. Solve problems using mental math.
4. Defend an answer using objects or logical argument.
5. Create rules to describe numeric sequences.

4TH GRADE

(Page 1 of 3)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Identify place value to the millions period.
2. Identify Roman Numerals using I, V, X, L, C, D, and M.
3. Recognize, read, and write numbers using standard form, expanded form, word form and expanded notation.
4. Compare, estimate, round, and order numbers to the millions period.
5. Use prime factorization to identify prime and composite numbers.
6. Plot whole numbers, fractions, and decimals on a number line.
7. Understand order of operations using multiplication, division, addition, and subtraction (MDAS).

B. Addition and Subtraction

The student will:

1. Estimate sums and differences of whole numbers.

C. Multiplication and Division

The student will:

1. Use a variety of models to illustrate multiplication and division.
2. Multiply multi-digit whole numbers including fluency of multiplication and division facts for 0 to 12.
3. Multiply by powers of 10.
4. Begin dividing by powers of 10.
5. Write remainders as a fraction.
6. Divide multi-digit whole numbers with one and two-digit divisors.
7. Master divisibility rules for 2, 3, 4, 5, 6, 9, 10, and 12.

D. Properties

The student will:

1. Understand the vocabulary with the transitive property of equality and inequality.
2. Correctly use the distributive property.
3. Use commutative, associative, and distributive properties to show how expressions are equivalent.

4TH GRADE

(Page 2 of 3)

E. Fractions, Decimals, Percentages, and Ratios

The student will:

1. Identify fractions numerically, using a number line, and using models.
2. Create equivalent fractions and simplify fractions.
3. Simplify mixed numbers.
4. Compare, order, and estimate fractions with unlike denominators.
5. Identify and write decimals to the thousandths place value.
6. Add and subtract decimals across zeros.
7. Compare and order decimals.
8. Round decimals to the nearest hundredth.
9. Convert decimals to fractions and fractions to decimals.
10. Find the LCM and GCF to add and subtract fractions and mixed numbers with like and unlike denominators.
11. Multiply decimals to the hundredths.
12. Use percent for simple applications such as tips, discounts, and grades.

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Choose and use appropriate units and tools for measuring weight, length, and capacity.
2. Read a customary ruler to the nearest $\frac{1}{16}$ inch.
3. Convert measurements in the following ranges: inches to miles, milligrams to kilograms, millimeters to kilometers, milliliters to kiloliters, ounces to tons, teaspoons to gallons.
4. Apply concept of scale to find unknown measurements.

B. Time

The student will:

1. Choose appropriate units of time from seconds through centuries.
2. Master elapsed time through years.

C. Money

The student will:

1. Make change by subtracting across zeros.
2. Estimate and round dollars and cents.
3. Recognize coins as part of a whole and represented as fraction of a dollar.
4. Add, subtract, and multiply money amounts.
5. Use the dollar sign appropriately in all money situations.

4TH GRADE

(Page 3 of 3)

III. GEOMETRY

The student will:

1. Master identifying, describing, sorting, and drawing the following shapes: circle, triangle, quadrilateral (including kite, rhombus, parallelogram, and trapezoid), and polygons up to 10 sides; cube, cylinder, sphere, cone, pyramid, and rectangular prism.
2. Calculate perimeter of polygons and area of rectangles.
3. Understand parts of a circle.
4. Master drawing rotational and line symmetry.
5. Identify and draw basic congruent shapes.
6. Master identifying characteristics and relationships of lines (vertical, horizontal, intersecting, parallel, and perpendicular).
7. Identify, draw, and measure a variety of angles using a protractor.
8. Introduce calculating missing angles of triangle.
9. Classify triangles by sides and angles,
10. Understand what ordered pairs are and know the different quadrants.
11. Show translation of different shapes.
12. Use straight edge and compass to construct basic elements and geometric figures.
13. Identify convex and concave polygons.
14. Master identifying, drawing, and labeling lines, line segments, and rays.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Interpret and construct graphs including stem and leaf, scatter, and histogram.
2. Utilize and calculate median, mode, and range to analyze data.
3. Use the data to draw conclusions and predict outcomes.
4. Understand and represent probability in numbers, represented as a fraction and decimal.
5. Calculate the probability of a single event using a variety of methods (tree diagram, array, ordered list).
6. Understand how to use a variety of methods (tree diagram, array, ordered list) to determine the probability of multiple events.
7. Use models and experiments to determine the probability and predict results.

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Recognize and duplicate sequential patterns with numbers.
2. Recognize, create, and predict number patterns.
3. Use mental math to solve for missing numbers or operational signs.
4. Defend an answer using logical argument.
5. Construct tables and use equations to describe simple relationships.
6. Write rules to describe numeric sequences.

5TH GRADE

(Page 1 of 3)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Identify place value through the trillions period.
2. Identify and factor prime and composite numbers.
3. Plot whole numbers, fractions, decimals, and percentages on a number line.
4. Correctly use order of operations (PEMDAS).
5. Compute squares and cubes with bases up to 20.

B. Addition and Subtraction

The student will:

1. Add and subtract integers.

C. Multiplication and Division

The student will:

1. Multiply multi-digit whole numbers.
2. Multiply and divide by powers of 10.
3. Write remainders as decimals, fractions, and whole numbers.
4. Divide multi-digit whole numbers by two-digit divisors.

D. Properties

The student will:

1. Master solving problems using the transitive property of inequality and equality.
2. Master solving problems with the commutative, associative, and distributive properties.
3. Demonstrate that expressions in different forms can be equivalent.

5TH GRADE

(Page 2 of 3)

E. Fractions, Decimals, Percentages, and Ratios

The student will:

1. Convert improper fractions to mixed numbers and mixed numbers to fractions.
2. Compare, order, and estimate fractions.
3. Add and subtract fractions with like and unlike denominators.
4. Find the least common denominator for two or more fractions.
5. Compare, order, and estimate decimals.
6. Convert terminating decimals, fractions, and percentages.
7. Find the LCM and the GCF.
8. Multiply and divide decimals (with both whole numbers and decimals in the divisor).
9. Multiply and divide fractions and mixed numbers.
10. Calculate percent in real world applications.
11. Represent and interpret quantities as ratios and proportions.

II. MEASUREMENT

A. Physical Characteristics

The student will:

1. Convert within customary and metric units of measurement, weight, and capacity.
2. Apply concept of scale to find unknown measurements.

B. Time

The student will:

1. Continue to apply and practice converting between units of time, distance, weight, etc.

C. Money

The student will:

1. Master recognizing that dollars and cents are decimals and that money may be represented as fractions of a dollar.
2. Master adding, subtracting, multiplying, and dividing money amounts.

III. GEOMETRY

The student will:

1. Identify and use formulas for area and perimeter for rectangles and triangles.
2. Identify elements of a circle.
3. Calculate the circumference and area of a circle.
4. Find the surface area and volume of three-dimensional shapes (cubes and rectangular prisms).
5. Define, identify, and draw similar, congruent, and symmetrical shapes.
6. Identify, draw, and measure a variety of angles.
7. Find and calculate missing angles of triangles and parallel lines cut by a transversal.
8. Classify triangles by sides and angles.
9. Graph and locate points on a four-quadrant graph using ordered pairs.
10. Show translation (slide), reflection (flip), and rotation (turn) of different shapes.
11. Use straight edge and compass to construct basic elements and geometric figures.

5TH GRADE

(Page 3 of 3)

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Interpret, construct, and analyze data in graphs including: box and whisker and circle.
2. Utilize and calculate mean, median, mode, and range of data sets.
3. Draw conclusions and predict outcomes from data.
4. Critique representations of data and data collection.
5. Understand and represent probability in numbers, represented as a fraction, decimal, and ratio.
6. Calculate the probability of single events using a variety of methods.
7. Calculate the probability of multiple events using a variety of methods.
8. Use models and experiments to determine the probability and predict results.

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Recognize, create, predict, and solve number patterns.
2. Use inverse operations to solve for unknown variables.
3. Evaluate expressions using substitution.
4. Use equations and formulas to solve problems.
5. Defend an answer using logical argument.
6. Construct and analyze tables and use equations to describe simple linear relationships.
7. Write rules to describe numeric sequences.

6TH GRADE

(Page 1 of 3)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning.
- Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
- Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Plot integers, fractions, percentages, decimals, and simple radicals on a number line.
2. Apply order of operations using groupings such as parentheses, brackets, absolute value, and fraction bars.
3. Understand exponents as repeated multiplication.
4. Write numbers using scientific notation (1.2×10^2 , 4.2×10^{-6}).
5. Understand absolute value as distance on from zero on a number line.
6. Begin to use the Laws of Exponents including negative exponents.
7. Understand square root as the inverse operation to squaring a number.
8. Compute square roots of perfect squares.

B. Addition and Subtraction

The student will:

1. Add and subtract integers.
2. Begin to add and subtract scientific notation.
3. Add and subtract absolute values.

C. Multiplication and Division

The student will:

1. Multiply and divide integers.
2. Multiply and divide absolute value.

D. Properties

Students should continue to identify and apply properties of commutative, associative, distributive, identity, and inverse.

The student will:

1. Apply the distributive property, including variables.

6TH GRADE

(Page 2 of 3)

E. Fractions, Decimals, Percentages, and Ratios

The student will:

1. Multiply and divide fractions and mixed numbers.
2. Calculate part to whole relationships:
 - a. Unknown part.
 - b. Unknown whole.
 - c. Unknown percentage.
3. Compute with percentages, decimals, integers, and fractions.
4. Convert between fractions, decimals, and percentages.
5. Represent and interpret quantities as ratios, rates, and proportions.

II. MEASUREMENT

The student will:

1. Continue to apply and practice converting between units of time, distance, weight, etc.

III. GEOMETRY

The student will:

1. Calculate perimeter and area of simple and complex 2-D shapes.
2. Identify elements of a circle (radius, diameter, chord).
3. Calculate the circumference and area of a circle.
4. Derive and calculate surface area and volume of 3-D shapes (cubes, prisms, cylinders).
5. Identify congruent shapes and corresponding sides and angles.
6. Measure angles with a protractor.
7. Calculating angles and missing angles.
8. Identify characteristics and relationships of angles (complementary, supplementary, adjacent, linear pair, vertical).
9. Graph points on a Cartesian coordinate plane using ordered pairs.
10. Identify the quadrant of an ordered pair.
11. Identify rigid transformations of shapes (translation, reflection, rotation).
12. Understand how scale factor relates to area.
13. Use straight edge and compass to construct basic elements and geometric figures.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Construct, interpret, and critique data in graphs (line, box and whisker, stem and leaf, histogram, bar, pie/circle, and scatter plot).
2. Utilize mean, median, mode, and range to analyze and summarize data.
3. Draw conclusions and predict outcomes from data.
4. Compare and contrast multiple representations of data and data collection.
5. Understand, predict, and represent probability as fractions, decimals, ratios, and percentages.
6. Calculate and analyze probabilities of multiple events in a variety of situations using multiplication.
7. Use an experiment to determine probability of a real-world event.

6TH GRADE

(Page 3 of 3)

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Use inverse operations to solve for one-variable single step equations and multi-step equations.
2. Evaluate expressions using substitution with integers, fractions, and decimals.
3. Solve equations with integers, fractions, and decimals.
4. Use equations and formulas to solve problems.
5. Construct and analyze tables and use equations to describe relationships.
6. Write rules to describe numeric sequences.
7. Find the point of intersection of two lines by graphing the lines from a table.
8. Introduce relationships and function vocabulary.
9. Graph linear functions using a table.
10. Graph inequalities on a number line.

7TH GRADE

(Page 1 of 2)

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

I. NUMBERS AND OPERATIONS

A. Number Sense

The student will:

1. Write numbers in scientific notation (1.2×10^2 , 4.2×10^{-6}).
2. Understand absolute value as distance from zero on a number line.
3. Use the Laws of Exponents to simplify expressions:
 - a. Use Rules of Exponents: product, quotient, and powers.
 - b. Use Property of Exponents: negative and zero.
4. Identify square root as the inverse operation to squaring a number.
5. Compute and memorize perfect squares 0-12.
6. Compute square roots using tables, estimation, and calculators.

B. Addition and Subtraction

The student will:

1. Add and subtract positive and negative rational numbers.
2. Add and subtract scientific notation.
3. Add and subtract absolute values.

C. Multiplication and Division

The student will:

1. Multiply and divide positive and negative rational numbers.
2. Multiply and divide with scientific notation.

D. Properties

Students should continue to identify and apply properties of commutative, associative, distributive, identity, and inverse.

7TH GRADE

(Page 2 of 2)

E. Fractions, Decimals, Percentages, and Ratios

The student will:

1. Master all computations between percentages, decimals, integers, and fractions.
2. Represent and interpret quantities as ratios, unit rates, rates of change, and proportions.
3. Calculate percent applications:
 - a. sales tax.
 - b. tip.
 - c. discount.
 - d. markup.
 - e. commission.
 - f. simple and compound interest.
 - g. percent increase and decrease.

II. MEASUREMENT

The student will:

1. Continue to apply and practice converting between units of time, distance, weight, etc.

III. GEOMETRY

The student will:

1. Derive and calculate the formula of 3-D shapes.
2. Solve problems involving 3-D objects and their side length, area, and volume using scale factor.
3. Define and apply the Pythagorean Theorem.

IV. STATISTICS, PROBABILITY AND DATA ANALYSIS

The student will:

1. Critique representations of data and data collection.
2. Understand, predict, and represent probability in numbers.
3. Calculate and analyze probabilities of multiple events using theoretical and experimental methods.
4. Model situations using experiments to determine probability and predict results.
5. Use the counting principle to determine a number of permutations.

V. FOUNDATIONS OF ALGEBRA

The student will:

1. Use inverse operations to solve for one-variable single step equations and multi-step equations.
2. Evaluate expressions using substitution with integers, fractions, and decimals.
3. Solve equations with integers, fractions, and decimals.
4. Use equations and formulas to solve problems.
5. Construct and analyze tables and use equations to describe simple relationships such as a linear relationship.
6. Write rules to describe numeric sequences.
7. Find the point of intersection of two lines with and without graphing the lines.
8. Identify relationships and function.
9. Solve and graph single and multi-step inequalities.
10. Graph linear functions.
11. Graph non-linear functions, including absolute value and parabolas, from a table.

ALGEBRA I

(Page 1 of 5)

This list includes all standards that should be mastered to complete a high school Algebra 1 course. The list is divided into two sections. Section 1 represents standards that should be mastered in an 8th grade Algebra course, designed to prepare students for Algebra 1 in high school. Section 2 should be included to represent a full high school Algebra 1 course. 8th graders will be required to take a high school placement test to determine appropriate placement in a freshman math class at the high school of their choice. Successful completion of this entire course is a prerequisite for Geometry and for Algebra II. Topics listed as REVIEW have been covered in the past, but instructor should verify student understanding before moving forward.

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

SECTION 1: ALGEBRA CONCEPTS FOR STUDENTS WHO WILL TAKE ALGEBRA 1 IN HIGH SCHOOL

I. PROPERTIES OF EXPRESSIONS AND EQUATIONS (REVIEW)

The student will:

1. identify variables and simplify expressions.
2. identify patterns and sequences.
3. evaluate expressions.
4. use order of operations to simplify expressions with variables.
5. define and use the identity and equality properties.
6. define and use the commutative and associative property with variables.
7. define and use the distributive properties.
8. define and use absolute value.

II. NUMBERS (REVIEW)

The student will:

1. identify integers on a number line.
2. use opposites, reciprocals, powers, and roots to solve problems.
3. add, subtract, multiply, and divide rational numbers.
4. estimate square roots.
5. compare the location of square roots within the real number set.
6. add, subtract, multiply, and divide integers using variables.

ALGEBRA I

(Page 2 of 5)

III. LINEAR EQUATIONS

The student will:

- 1 solve equations using addition, subtraction, multiplication, and division.
- 2 solve multi-step equations to include word problems and literal equations.
- 3 solve equations using formulas of basic geometric figures.
- 4 solve equations using formulas for rate, work, interest, percent, and mixture problems.

IV. PROPORTIONAL REASONING

The student will:

- 1 set up and solve problems using ratio and proportion.
- 2 use proportions and similar polygons to reduce and enlarge figures.
- 3 use direct and inverse variations to solve problems.
- 4 use slope ratio to investigate the $\Delta y/\Delta x$ ratio.
- 5 solve percent problems using ratio and proportion.

V. RELATIONS AND FUNCTIONS

The student will:

- 1 contrast and compare of relations and functions.
- 2 determine the domain and range using graphs, ordered pairs, and symbolic expressions.
- 3 write equations from linear patterns.

VI. LINEAR FUNCTIONS

The student will:

- 1 determine if a point lies on a given line.
- 2 define and calculate slope.
- 3 graphing linear functions.
- 4 write linear equations in point-slope, slope-intercept, and standard form.
- 5 determine the x and y-intercept from the equation, table, or graph.
- 6 write the equation of a line given two points or the slope and one point.
- 7 convert between the table, graph, and equation representations of the function.
- 8 identify transformations in the graph of a line based on changes in slope and y-intercept.
- 9 identify parallel and perpendicular lines based on slope.
- 10 write equations of lines parallel and perpendicular to a given line.
- 11 write equations, determine slope and graph horizontal and vertical lines.
- 12 solving word problems using linear functions.

ALGEBRA I

(Page 3 of 5)

VII. SOLVING LINEAR INEQUALITIES

The student will:

1. solve inequalities.
2. solve compound inequalities.
3. solve inequalities involving absolute value.
4. graph linear inequalities to include 1 and 2 variables.

VIII. SYSTEMS OF EQUATIONS

The student will:

1. graph systems of equations.
2. solve system equations using the substitution method.
3. solve system equations using elimination method.
4. solve systems of linear inequalities graphically.

SECTION 2: ADDITIONAL ALGEBRA CONCEPTS FOR STUDENTS HOPING TO TEST OUT OF ALGEBRA 1

IX. POLYNOMIALS

The student will:

1. identify properties of polynomials.
2. add and subtract polynomials.
3. multiply and factor polynomials.

X. FACTORING

The student will:

1. factor polynomials using the greatest common factor.
2. factor trinomials with a leading coefficient of one.
3. factor trinomials with a leading coefficient other than one.
4. factor differences of squares.
5. factor perfect squares.
6. simplify rational expressions by factoring and reducing.

ALGEBRA I

(Page 4 of 5)

XI. QUADRATIC FUNCTIONS

The student will:

- 1 use the general properties of the parent graph of a parabola to include the horizontal shift, vertical shift, and stretch factor.
- 2 graph quadratic functions.
- 3 solve quadratic equations by graphing.
- 4 solve equations by factoring, including the zero-product property.
- 5 solve quadratic equations by using the quadratic formula.
- 6 solve quadratic equations by completing the square.

XII. OTHER NONLINEAR FUNCTIONS

Using an xy table, the student will:

- 1 graph cubic functions.
- 2 graph exponential functions.
- 3 graph the square root functions.
- 4 graph the hyperbolic functions.
- 5 graph absolute value functions.

XIII. RATIONAL EXPRESSIONS AND EQUATIONS

The student will:

- 1 simplify rational expressions.
- 2 multiply and divide rational expressions.
- 3 add and subtract rational expressions with like denominators using variables.
- 4 add and subtract rational expressions with unlike denominators using variables.
- 5 simplify mixed expressions and complex fractions.
- 6 solve rational equations.

ALGEBRA I

(Page 5 of 5)

XIV. RADICAL EXPRESSIONS AND EQUATIONS

The student will:

1. simplify radical expressions.
2. add, subtract, multiply, and divide radical expressions.
3. develop the Pythagorean Theorem.
4. apply the Pythagorean Theorem to find the length of the sides of a right triangle.
5. apply the Pythagorean Theorem to find the distance between two points.
6. solve radical equations.
7. apply the quadratic formula to solve problems.
8. graph quadratic functions showing that the real roots are the x-intercepts, and determine whether a function will intersect in 0, 1, or 2 points.

XV. ALGEBRAIC LOGIC

The student will:

1. use properties of the number system to judge the validity of results, justify steps in a procedure, and prove/ disprove statements.
2. use simple aspects of logical argumentation to solve problems using patterns.

HIGH SCHOOL: GEOMETRY

(Page 1 of 4)

Geometry is a complete college preparatory course of plane and solid geometry. It is recommended that there be a strand of algebra review woven throughout the course to help students maintain their understanding of algebra and the use of their algebraic skills. The exploration of various proof methods is recommended. Such methods are two and three column proofs, flowcharts, and paragraph formats. Constructions for the sake of visualization is encouraged which may include construction tools, paper folding, and geometry software investigations.

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

I. LANGUAGE OF GEOMETRY (REVIEW)

1. Undefined terms: points, lines, and planes
2. Defined terms: angle, bisector, midpoint, etc.

II. LOGICAL REASONING

1. Conditional and bi-conditional statements
2. Written justification for logical arguments
3. Inductive and deductive reasoning
4. Converses and proof by counterexample
5. Introduce proof by contradiction (IF TIME)
6. Truth tables

III. LINES AND SEGMENTS

1. Properties of parallel and perpendicular lines (REVIEW)
2. Properties associated with perpendicular bisectors
3. Application of the Distance and Midpoint formulas

IV. GRAPHS (REVIEW)

1. Graphs and equations of linear functions
2. Equations of both parallel and perpendicular lines
3. Equations of both vertical and horizontal lines
4. Plane regions formed by linear equations

HIGH SCHOOL: GEOMETRY

(Page 2 of 4)

V. PLANE FIGURES

1. Concept development of area and perimeter and their units of measure (REVIEW)
2. Properties and their proofs for quadrilaterals
3. Properties of triangles
4. Properties of regular and irregular polygons
5. Properties associated with medians, altitudes, perpendicular bisectors, angle bisectors, and their points of intersection
6. Concept development for perimeter formulas for all polygons
7. Concept development for area formulas for polygons
8. Area of polygons using figure dissection
9. Application of the Triangle Inequality Theorem (Ex. 3,5,8 triangle can't exist)
10. Heron's Formula (IF TIME)
11. Coordinate proofs of triangles and quadrilaterals

VI. ANGLES

1. Concept development of angle measure (REVIEW)
2. Skill development with use of a protractor to measure angles (REVIEW)
3. Properties and relationships of complementary and supplementary angles (REVIEW)
4. Conjectures and converses for angle relationships formed by parallel lines and transversals
5. Application of the Vertical Angles Theorem
6. Application of the Exterior Angle Theorem for triangles
7. Application of the Triangle Angle Sum Theorem and its Right Triangle Corollary
8. Application and proof of the Isosceles Triangle Theorem
9. Formula development to find the sum of the angles of a polygon
10. Formula development to find the interior angle measurement in regular polygons
11. Formula development to find the sum of the exterior angles of a polygon

VII. SIMILARITY

1. Concept development for an intuitive understanding of similarity (REVIEW)
2. Scale drawings as an application of similarity (REVIEW)
3. AA, SAS, SSS similarity theorems
4. Application problems using the similarity properties
5. Mid-segment theorem
6. Parallel lines and proportional segments
7. Formula development of ratios for perimeter, area and volume using similar figures or solids
8. Application problems using ratios for length, area, and volume

HIGH SCHOOL: GEOMETRY

(Page 3 of 4)

VIII. CONGRUENCY

1. Concept development of congruence
2. Concept development for corresponding parts of two congruent figures
3. Fundamental congruence postulates for triangles: SSS, SAS, ASA, AAS, HL
4. Proofs using congruent triangles

IX. CIRCLES

1. Basic properties of a circle to include investigations of pi
2. Area and circumference of circles (REVIEW)
3. Central angle and area of sectors in circles
4. Central angle and arc length relationships in circles
5. Concept development and proofs for the theorems of angles, chords, secants, and tangent segments
6. Introduction and application of the equation of a circle (IF TIME)

X. PYTHAGOREAN THEOREM

1. Radical expressions and simplification review
2. Concept development of the Pythagorean Theorem and its converse
3. Pythagorean Theorem application to find the lengths of unknown sides
4. Pythagorean Theorem application to find the distance between a point and a line

XI. TRIGONOMETRY

1. Exploration of the sine, cosine, and tangent values using a calculator
2. Concept development for the sine, cosine, and tangent ratio for right triangles
3. Concept development of the relationship between the tangent and slope ratios
4. Application problems using trigonometric ratios
5. Proof for and application of the 30-60-90 and 45-45-90 Triangle Theorems
6. Concept development and use of the Law of Sines as proportionality (IF TIME)

XII. SOLID FIGURES

1. Introduction to nets of three-dimensional figures
2. Concept development of volume and surface area
3. Concept development of the formulas for the volume of prisms, cylinders, pyramids, cones, and spheres
4. Concept development of the formulas for the surface area of prisms, cylinders, pyramids, cones, and spheres
5. Application of surface area and volume formulas

HIGH SCHOOL: GEOMETRY

(Page 4 of 4)

XIII. TRANSFORMATIONAL GEOMETRY

1. Line symmetry and reflections, including on coordinate axis
2. Translations, rotations, and dilations, including on coordinate axis
3. Introduction and exploration of tessellations (IF TIME)

XIV. GEOMETRIC PROBABILITY

1. Concept development of geometric probabilities
2. Applications of geometric probability

XV. CONSTRUCTIONS

1. Use of a compass for geometric construction
2. Construction of congruent segments and angles
3. Construction of a perpendicular bisector of a segment (midpoint)
4. Construction of an angle bisector
5. Construction to prove the SSS, SAS, ASA, AAS Triangle Theorems

HIGH SCHOOL: ALGEBRA II

(Page 1 of 4)

This is an Advanced Algebra course designed for students who have satisfactorily completed both the college-preparatory Algebra I and Geometry courses. Topics to be covered are listed below.

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

I. LINEAR FUNCTIONS (REVIEW)

1. Properties of linear functions
2. Graphs of linear functions to include the vertical and horizontal shifts, and stretch factors
3. Slope-intercept form
4. Point-slope form
5. Applications of the linear function
6. Solving linear equations

II. EXPONENTIAL FUNCTIONS (REVIEW)

1. Properties of exponential functions
2. Graphs of the exponential function to include the vertical and horizontal shifts, and stretch factors
3. Effects of negative and rational exponents to the exponential function
4. The properties of the number e
5. Applications of the exponential function to growth and decay

III. LOGARITHMIC FUNCTIONS

1. Properties of inverse functions
2. Connections between the exponential and logarithmic functions
3. Properties and graphs of logarithmic functions to include the vertical and horizontal shifts, and stretch factors
4. Solving logarithmic equations
5. Application of the logarithmic functions

HIGH SCHOOL: ALGEBRA II

(Page 2 of 4)

IV. QUADRATIC FUNCTIONS

1. Properties of quadratic functions
2. Graphs of quadratic functions to include the vertical and horizontal shifts, and stretch factors
3. Properties of quadratic functions in standard and intercept form
4. Completing of the square process
5. Proof and use of the quadratic formula
6. Factoring the quadratics in their enhanced form

V. SYSTEMS OF EQUATIONS

1. Solving systems of equations using the graphing method and algebraic method
2. Solving linear systems using matrices
3. Properties and graphs of inequalities
4. Solving equations using absolute value
5. Solving systems of inequalities
6. Linear programming

VI. RADICAL FUNCTIONS

1. Properties of the square root function
2. Graphs of the square root function to include vertical and horizontal shifts, and stretch factors
3. Properties of radical functions
4. Graphs of radical functions to include vertical and horizontal shifts, and stretch factors
5. Solving radical equation
6. Properties of complex numbers

VII. POLYNOMIAL FUNCTIONS

1. Properties of polynomials
2. Multiplying and dividing polynomials
3. Graphs of polynomials to include vertical and horizontal shifts, and stretch factors
4. Finding zeros of polynomial functions
5. Solving cubic equations
6. Descartes's Rule of Signs (IF TIME)

HIGH SCHOOL: ALGEBRA II

(Page 3 of 4)

VIII. RATIONAL FUNCTIONS

1. Inverse variation
2. Properties of rational functions
3. Graphs of rational functions to include vertical and horizontal shifts, and stretch factors
4. Solving rational equations

IX. SERIES AND SEQUENCES

1. Properties of arithmetic sequences
2. Properties of geometric sequences
3. Recursion formulas
4. Sums of arithmetic and geometric series
5. Infinite geometric series

X. CONIC SECTIONS

1. Distance and midpoint formulas (REVIEW)
2. Slopes of parallel and perpendicular lines (REVIEW)
3. Properties of the parabola, circle, ellipse, and hyperbola
4. Graphs of the parabola, circle, ellipse, and hyperbola
5. Identification of second degree equations

XI. TRIANGLE TRIGONOMETRY

1. Right triangle trigonometry (sin, cos, tan, csc, sec, cot)
2. Angles of rotation
3. Area of a triangle
4. Law of sines
5. Law of cosines

XII. TRIGONOMETRIC FUNCTIONS (IF TIME)

1. Unit circle properties of the sine and cosine
2. Radian measure
3. Amplitude, period, and phase shifts
4. Tangent function
5. Graphs of the sine, cosine, and tangent functions to include the vertical and horizontal shifts, and stretch factors
6. Inverse trig functions (arccos, arcsin, etc.)

HIGH SCHOOL: ALGEBRA II

(Page 4 of 4)

XIII. DATA and STATISTICS (IF TIME)

1. Design a study
2. Distributions of data in general
3. Probability distributions
4. Binomial distribution
5. Normal distribution
6. Confidence intervals and hypothesis testing

HIGH SCHOOL: PROBABILITY AND STATISTICS

(Page 1 of 2)

This course shows students how statistics is used to picture and describe the world. With this knowledge, students will be able to make informed decisions about their world as contributing members of society. This course should be offered as an elective upper division course. Topics to be covered are listed below.

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

I. INTRODUCTION TO STATISTICAL MEASURES

1. Methods of data classification
2. Design experiments

II. DESCRIPTIVE STATISTICS

1. Frequency distributions and their graphs
2. Measures of central tendency
3. Measures of variation
4. Measures of position

III. PROBABILITY

1. Basic concepts of probability
2. Conditional probability and the multiplication rule
3. Addition rule
4. Counting principles

IV. DISCRETE PROBABILITY DISTRIBUTIONS

1. Probability distributions
2. Binomial distributions
3. Discrete probability distributions to include Poisson distributions

V. NORMAL PROBABILITY DISTRIBUTIONS

1. Normal distributions
2. Standard normal distribution
3. Central limit theorem
4. Normal approximations to binomial distributions

HIGH SCHOOL: PROBABILITY AND STATISTICS

(Page 2 of 2)

VI. CONFIDENCE INTERVALS

1. Confidence intervals for the mean for large samples
2. Confidence intervals for the mean for small samples
3. Confidence intervals for population proportions
4. Confidence intervals for variance and standard deviation

VII. HYPOTHESIS TESTING WITH ONE SAMPLE

1. Definition of hypothesis testing
2. Hypothesis testing for the mean for $n \geq 30$
3. Hypothesis testing for the mean for $n < 30$
4. Hypothesis testing for proportions
5. Hypothesis testing for the variance and standard deviation

VIII. HYPOTHESIS TESTING WITH TWO SAMPLES

1. Testing the difference between two means – large independent samples
2. Testing the difference between two means – small independent samples
3. Testing the difference between two means – dependent samples
4. Testing the difference between two proportions

IX. CORRELATION AND REGRESSION

1. Definition of correlation
2. Definition of linear regression
3. Measures of regression and prediction intervals
4. Multiple regression

X. CHI-SQUARE TESTS AND THE F-DISTRIBUTION

1. 'Goodness of Fit' concept
2. Independence
3. Comparing two variances
4. Analysis of variance

XI. NONPARAMETRIC TESTS

1. Sign test
2. Wilcoxon tests
3. Kruskal-Wallis test
4. Rank correlation

HIGH SCHOOL: PRECALCULUS

(Page 1 of 4)

This course combines algebraic, geometric, and trigonometric ideas and techniques that are needed to prepare students for calculus. It introduces students to the concept of limit. This course is frequently taught in conjunction with an in-depth study of trigonometry or with linear algebra or statistics if the trigonometric concepts were taught completely in the Algebra II course. The topics to be addressed are listed below.

CATHOLIC DISPOSITIONS

- Develop the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning in the pursuit of transcendent truths.
- Develop lines of inquiry to understand why things are true and why they are false.
- Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
- Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

I. FUNCTION ANALYSIS (REVIEW EXCEPT FOR ITEMS 3 AND 8)

1. Properties of relations and functions
2. Properties and graphs of piecewise functions
3. Continuity
4. Functional properties of parallel and perpendicular lines
5. Properties of odd and even functions
6. Properties of increasing and decreasing functions
7. Properties of domain, range, maxima, minima, and end-behavior
8. Properties of limits to include at a point and at infinity

II. FUNCTIONS, EQUATIONS, AND INEQUALITIES (REVIEW)

1. Equation solving techniques to include systems of equations
2. Properties of composite functions to include the domain and range
3. Properties of inverse functions to include the domain and range
4. Approximate solutions to equations
5. Inequality equation solving techniques
6. Graphs of inequalities to include the vertical and horizontal shifts, and stretch factors
7. Absolute value equation solving techniques
8. Graphs of absolute value equations to include the vertical and horizontal shifts, and stretch factors
9. Linear programming

HIGH SCHOOL: PRECALCULUS

(Page 2 of 4)

III. INTEGERS AND POLYNOMIALS (REVIEW)

1. Factors of polynomial
2. Zeros of a polynomial
3. Quotient/ remainder theorem
4. Division of polynomials
5. Synthetic division
6. Remainder and factor theorems
7. Quadratic equations and inequalities

IV. RATIONAL NUMBERS AND FUNCTIONS

1. Rational numbers and expressions
2. Irrational numbers
3. Properties of rational functions
4. End behavior of rational functions
5. Graphs of rational functions
6. Solving rational equations

V. EXPONENTIAL AND LOGARITHMIC FUNCTIONS

1. Properties and use of rational exponents
2. Properties and graphs of exponential functions
3. Properties and graphs of logarithmic functions
4. Solving the exponential and logarithmic equations
5. The number e
6. Properties and graphs of natural logarithmic functions

HIGH SCHOOL: PRECALCULUS

(Page 3 of 4)

VI. TRIGONOMETRIC FUNCTIONS

1. Properties of the circular functions
2. Radian measure
3. Trigonometric functions of special angles
4. Right triangle trigonometry
5. Law of sines
6. Law of cosines
7. Ambiguous case
8. Parent graphs of $\sin(x)$, $\cos(x)$, $\tan(x)$ and their reciprocals
9. Properties of trigonometric graphs to include the vertical shift, horizontal shift and stretch factor components
10. Properties of inverse trigonometric functions
11. Properties of inverse trigonometric graphs to include the vertical shift, horizontal shift and stretch factor components

VII. TRIGONOMETRIC IDENTITIES AND EQUATIONS

1. Trigonometric identities
2. Proofs of identities
3. Sum/ difference formulas
4. Double-angle formulas
5. Half-angle formulas
6. Solving trigonometric equations
7. Solving trigonometric inequalities

VIII. VECTORS AND PARAMETRIC EQUATIONS

1. Geometric and algebraic vectors
2. Vectors in three-dimensional space
3. Perpendicular vectors
4. Dot product, cross product, and the angle between vectors
5. Applications using vectors to include directional problems
6. Properties and graphs of parametric equations
7. Applications of parametric equations to model motion

HIGH SCHOOL: PRECALCULUS

(Page 4 of 4)

IX. POLAR COORDINATES AND COMPLEX NUMBERS

1. Properties of complex numbers
2. Distinguish the characteristics and uses of vectors in representations of velocity and force
3. Polar coordinates
4. Conversions between the polar and rectangular systems
5. Polar equations and their graphs
6. Product and quotients of complex numbers in polar form
7. Powers of complex numbers
8. Roots of complex numbers

X. CONICS

1. Properties of the parabola, hyperbola, and ellipse
2. Graphs of the conics and their degenerates: the line and circle
3. Transformations of the conics
4. Solving quadratic systems to include inequality properties

XI. RECURSION AND MATHEMATICAL INDUCTION

1. Recursion and explicit formulas
2. Arithmetic and geometric series
3. Principle of mathematical induction

XII. AREA UNDER THE CURVE: INTEGRATION (IF TIME)

1. Area of rectangles / trapezoids / Riemann sums
2. Summation and sigma notation
3. Graphical interpretation
4. Area of rectangles using the left and right endpoints
5. Application of distance as area
6. Definite integral of polynomial functions

XIII. RATES OF CHANGE: DERIVATIVE (IF TIME)

1. Rates of change
2. Secants and tangents to the curve
3. Graphical interpretation of the derivative
4. Derivative at a point
5. Derivative of a function
6. Applications: velocity, acceleration, and critical points on a polynomial

HIGH SCHOOL: OTHER COURSES

(Page 1 of 1)

The Calculus AB and Calculus BC courses should follow the course outline as specified by the College Board.

Some electives at the high school level might include the following based on staff availability and student interest:

- Discrete Finite Math
- Consumer Math
- Accounting
- Mechanical Drawing

2018 Math Scope and Sequence

I = Introduce D = Develop M = Master

After Mastery, constant application and extension in real world contexts should be ongoing.

I. Numbers and Operation

A. Number Sense	PK	K	1	2	3	4	5	6	7	8
Counting and skip counting	I	I	D	D	M					
Identify one-to-one correspondence in a set	I/D	M								
Recognize, read, and write numbers (standard form, expanded form, expanded notation, word form) (random order, difference between letters and numbers)	I	I	D	D	D	D	M			
Recognize whole numbers on a number line (numbers in between greater than less than)	I	I	D	M						
Equate “zero” as a quantity of nothing	I	I/D	M							
Estimate (guess amount of objects before counting) and round numbers	I	I	D	D	D	M				
Recognize and Create a group of a given number of objects	I	I/D	M							
Compare Numbers	I	I	D	M						
Recognize ordinal numbers	I	I/D	M							
Identify Odd and Even Numbers		I	D	M						
Order numbers		I	D	D	D	M				
Place Value			I	D	D	D	M			
Order of Operations			I	D	D	D	D	M		
Plot numbers on a number line				I	D	D	D	M		
Define and identify prime and composite numbers						I/D	M			

A. Number Sense	PK	K	1	2	3	4	5	6	7	8
Prime factorization						I/D	M			
Understand exponents as repeated multiplication							I	D/M		
Write numbers in scientific notation							I	D	M	
Laws of Exponents including negative exponents								I	D	M
Square root as the inverse operation to squaring a number								I	D	M
Compute and memorize perfect squares 0-12								I	D	M
Compute square roots using tables, estimation, and calculators								I	D	M
Understand absolute value as distance on from zero on a number line, use appropriate symbol							I	D	D	M

B. Addition & Subtraction After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Use models to illustrate addition and subtraction	I	I	D	D	M					
Add/Subtract Whole Numbers without regrouping	I	I	D	M						
Demonstrate addition and subtraction facts with fluency		I	D	M						
Add/Subtract Whole Numbers with regrouping			I	D	M					
Estimate sums and differences of whole numbers			I	D	D	M				
Add and subtract integers								I/D	M	
Add and subtract scientific notation								I	D	M
Add and subtract absolute value								I	D	M

C. Multiplication & Division After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Use repeated addition as a model for multiplication, and repeated subtraction as a model for division				I/D	M					
Use models to illustrate multiplication and division				I	D	M				
Demonstrate fluency with multiplication and division facts				I	D	M				
Multiply multi-digit whole numbers					I	D	M			
Multiply and divide by powers of 10					I	D	M			
Write remainders					I	D	M			
Divide multi-digit whole numbers					I	D	M			
Recite Divisibility Rules					I/D	M				
Multiply and divide with integers								I/D	M	
Multiply, divide and apply exponents large and small numbers in scientific notation									I/D	M
Multiply and divide absolute value								I	D	M

D. Properties After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identity Property of Zero	I	I/D	M							
Properties of addition and subtraction		I	D	M						
Transitive Properties of Inequality and Equality			I	D	D	D	M			

Identify inverse operations of addition and subtraction			I/D	M						
Properties of multiplication and division				I/D	M					
Identify Inverse Operations of multiplication and division				I	D/M					
Distributive Property					I	D	M			
Use commutative, associative, and distributive properties to demonstrate that expressions in different forms can be equivalent					I	D	M			

E. Fractions, Decimals, Percents, and Ratios After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identify unit/simple fractions		I	D	D	D	M				
Equivalent/Simplified Fractions				I	D	M				
Mixed Numbers					I	D	M			
Compare, Order, Estimate Fractions				I	D	D	M			
Identify Decimals as part of a whole				I	D	M				
Write Decimals				I	D	M				
Add/Subtract Decimals				I	D	M				
Add/Subtract Fractions/Mixed Numbers					I	D	M			
Compare & Order Decimals					I	D	M			
Round Decimals					I/D	M				
Convert decimals to equivalent fractions and percents					I	D	D	M		
Find LCM/LCD and GCF					I	D	M			

Multiply/Divide Decimals						I	D/M			
Multiply/divide Fractions/Mixed Numbers							I/D	M		
Calculate percent applications						I	D	D	M	
Computations of percent, decimals, and fractions of integers							I	D	M	
Represent and interpret quantities as ratios, rates, and proportions							I	D	D	M

II. Measurement

A. Length, Weight, Capacity After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Estimate, Measure, Compare, Order objects with standard/non-standard units	I	I/D	D	M						
Choose and use appropriate units and tools for measuring various objects		I	D	D	D	M				
Compute and Convert measurements with various units		I	D	D	D	D	M			
Apply concept of scale to find unknown measurements					I	D	M			

D. Time After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identify and understand units of time	I	I/D	D	D	D	M				
Read and Write time using an analog clock		I	D	D	M					
Identify and understand calendar concepts	I	I/D	M							
Compute elapsed time using various measurements			I	D	D	M				

E. Money After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identify, count, and write coins and bills		I	D	D	M					
Add total value of mixed coins and dollar bills			I	D	M					
Make change				I	D	M				
Estimate and round dollars				I	D	M				
Recognize that dollars and cents are decimals, and that money may be represented as fractions of dollars				I	D	D	M			
Add, subtract, multiply, and divide money amounts				I	D	D	M			

III. Geometry

A. Geometry After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identify, describe, sort, and draw 2-D and 3-D shapes	I	I	D	D	D	M				
Calculate perimeter and area of polygons and composite 2-D shapes					I	D	D	M		
Elements of a circle						I	D	M		

Calculate the circumference and area of a circle							I	D/M		
Calculate surface area and volume of 3-D shapes							I	D	M	
Symmetry of shapes				I	D	M				
Congruent shapes				I	D	D	D	M		
Identify characteristics and relationships of lines				I	D	M				
Identify characteristics and relationships of angles					I	D	D	M		
Calculating angles and missing angles						I	D	M		
Classify triangles by sides and angles					I	D	M			
Graph points on a Cartesian coordinate system using ordered pairs						I	D	M		
Transform shapes to include translation, reflection, rotation						I	D	M		
Solve problems involving geometric shapes using scale factor (dilation)								I/D	M	
Use appropriate tools to construct basic elements and geometric figures						I	D	M		
Define and apply the Pythagorean Theorem									I/D	M

IV. Data Analysis, Probability, and Statistics

After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Collect and organize data		I	D	M						
Represent, construct, and interpret data in graphs		I	D	D	D	D	D	M		
Utilize mean, median, mode, and range to analyze and summarize data					I	D	D	M		
Draw conclusions and predict outcomes from data					I	D	D	M		
Critique representations of data and data collection							I	D	D	M
Understand, predict, and represent probability in words				I/D	M					
Understand, predict, and represent probability in numbers					I	D	D	M		
Calculate and analyze probabilities of single events in a variety of situations					I	D	M			
Calculate and analyze probabilities of multiple events in a variety of situations							I	D	M	
Model situations using experiments to determine probability and predict results						I	D	D	M	

V. Foundations of Algebra

After Mastery, constant application and extension in real world contexts should be ongoing.	PK	K	1	2	3	4	5	6	7	8
Identify, sort, and classify objects by their attributes	I	I/D	M							
Recognize, duplicate, and continue sequential patterns with figures	I	I	D	M						
Recognize, duplicate, and continue sequential patterns with numbers			I	D	D	M				
Recognize, create, predict, and solve number patterns			I	D	D	D	M			
Using mental math, solve for missing numbers or operational signs			I	D	D	M				
Defend that your solution(s) is/are correct			I	D	D	M				
Use inverse operations, solve for unknown variables							I	D	D	M
Evaluate expressions using substitution							I	D	M	
Use equations and formulas to solve problems							I	D	D	M
Construct and analyze tables and use equations to describe simple relationships						I	D	D	D	M
Write rules to describe numeric sequences					I	D	D	D	D	M
Find the point of intersection of two lines with and without graphing the lines								I	D	M

Identify relationships and functions								I	D	M
Graph linear and nonlinear functions								I	D	M
Solve linear single and multi-step inequalities								I	D	M
Graph linear inequalities								I	D	M

MATHEMATICS TEXTBOOK RECOMMENDATIONS

May 2018

The Math Curriculum Committee reviewed many series of textbooks made available by suppliers. The instrument used for evaluation is available in this guideline for local use.

This list is not an inclusive list of all possible textbooks available to our schools, rather it is the sampling of textbooks the committee was able to review. This list is meant to serve as a recommendation of textbooks that could be used, or are recommended to not be used, with the caveat that textbook selection is a school-based decision.

If a school chooses to adopt a textbook that is not listed below, please contact the Office of Catholic Schools for review of that specific textbook before use.

It is possible and acceptable for a school to use a different textbook series in the primary grades from that used in the higher grades. The content of the curriculum guide rather than the textbook should determine the focus for classroom instruction. Continuity from grade to grade is a concern if different series are used and faculty members who do this will need to establish a school norm addressing the terms that are used for specific operations and processes to aid students in smooth transition. Teachers are encouraged to seek outside resources to supplement any curricular resources and in order to meet student mastery of the standards.

The 2018 Math Standards provide that ordinarily 8th graders will take Algebra I. Some students may not be prepared for this course. Textbooks for those students who are not ready to take Algebra I as 8th graders and require a pre-algebra course are reviewed and evaluated in these textbook recommendations.

RECOMMENDED

Sadlier Math (K-6)

Sadlier / Oxford

2018

Sadlier Math is the updated version of Progress in Math (which was the most highly recommended textbook of the 2010 Textbook Recommendation list). The Sadlier Math series covers most of the AoDCS standards and covers them better than other texts; some in even more depth than our guidelines, though not every archdiocesan standard is covered, and supplemental materials would still be necessary to cover some standards. It is easy to follow. There are plenty of practice items in the textbook, so the workbook may not be needed, but it is available. The series uses many real-life examples that answer the question, “Why do we have to learn this?” It provides for higher level thinking skills, and pre-assessment and post-assessments are available for each chapter.

The teacher edition provides good pacing and planning guides for the teacher. It would be especially helpful for new teachers since the series includes background building for teachers and gives teachers ideas for teaching concepts.

Saxon Math (K-6)

Houghtin Mifflin Harcourt

2018

The committee found the Saxon Math series to be overall very good. The content was easily laid out. The content is broken out into sections, not chapters, which is called the integrated learning approach. Each topic is covered throughout the whole year—the topic begins simply and as more complicated ideas are introduced to that concept, it continues being practiced throughout each section. The series suggests lots of built-in time for practice which allows for one-on-one teaching with students. The series includes an oral assessment resource, which the

committee felt was a helpful component, in particular for children with accommodations or who struggle to show their math knowledge because of a lack of literacy skills. There is a glossary in Spanish and English and a lot of supplementary materials.

The committee had concern that with so much spiraling of covered content, there may not be depth of concepts covered, though the series does include ideas for differentiating, in particular for extension activities for students who need to go deeper with their content. The series is very formulated and does not necessarily help students think creatively, however, the committee unanimously agreed that Saxon provides such a solid set of foundational math skills that it is easy to build that creative problem solving with the strong foundation set by Saxon.

Making Connections:

Foundations for Algebra 1 & 2 Grades 6 & 7 CPM (College Preparatory Math) 2011

Making Connections:

Algebra 1 Grade 8 CPM (College Preparatory Math) 2011

This series is intended for middle school math instruction, and the series is not offered for elementary grades. The series includes Geometry, Algebra 2, and Calculus. Teachers in our diocese have used Making Connections: Foundations for Algebra 1 & 2 as one textbook that encompasses all of 6th and 7th grade in one textbook.

The series is structured around team work; the book sets up team structures, rules, and team roles, and the teams learn the math and communicate the math to their teams. Because of the team structure, the teacher is the facilitator. This could be a complication for teachers teaching 2 courses in one class period. Because the textbook is very text heavy and the instruction relies on oral communication, this series could be particularly challenging for students for ESL students.

The series includes a lot of spiraling back to previously learned material, as well as preview problems which challenge students who need more challenging work and gives them an idea of concepts that are coming up. The series includes homework help, parent guides to teach the parents how to help their students, and a Spanish version of the text and parent guide. The series also includes an outside the classroom application in each lesson, that is how the math concept would apply to an outside the classroom concept. There is also free professional development offered through CPM.

Big Ideas Math Grades 6-8 and HS Big Ideas Learning 2015

This series included a good layout for student understanding. It has guided practice and checks for understanding with a lot of sample practice problems. The series includes a test bank online so teachers can create their own tests, and the test bank includes a way to respond to data by pulling test bank questions for questions that students scored incorrectly on previous tests. There are different levels of assessments available in the test bank from less challenging to more challenging. Teachers who worked with this series who also served on the committee were very happy with the content included in the textbooks and felt it aligned well to our AODCS standards.

Glencoe Pre-Algebra through Calculus McGraw Hill 2018

This series includes Pre-Algebra through Calculus. It includes quality test banks and lots of versions of assessments available online. Teachers have found they do have to modify the assessment to meet our diocesan standards, however, the assessments can be edited online. The series is a very traditional approach with good high-level problems. It has a good layout for student understanding, lots of guided practice, and the checks for understanding include a lot of problems.

RECOMMENDED WITH CAUTION

Math In Focus (K-5)

Houghton-Mifflin

2009

This edition of textbooks from Houghton-Mifflin incorporates the Singapore Math problem-solving strategy. The committee reviewed the materials and concluded that when students are taught Math in Focus for their entire time in elementary school, there is a good depth of knowledge that can be drawn from instruction using these materials. The reason is that the books are prescriptive—a teacher cannot deviate from the order of the textbook, and grade levels cannot opt out of using the text book—which leads to gaps if a student comes in mid-program and did not receive Math in Focus instruction before coming into the school. The committee also cautioned that with such a prescriptive textbook, it is easier for a teacher to teach to the textbook instead of teaching to the standards, which could lead to gaps in mathematical knowledge according to the standards. Teachers using these materials also found that basic skills of math are not practiced frequently enough and so teachers have found they have to supplement that basic skill practice. There are also concerns that language used in the text could be particularly difficult for ESL students. However, the committee did feel that the series is strong enough that if a school and parent community make a commitment to using the program and sticking with it, then there can be incredible instruction from this set of materials.

ACCEPTABLE

Every Day Math (1-5)

McGraw Hill

2007

This series covers our objectives but is hard to follow. The presentation spirals, so a teacher might need to search for the appropriate items. Our guidelines are focused on mastery and this series does not follow that philosophy. It is very scripted so there is less room for teacher flexibility but might be good for a beginning teacher. It uses non-standard algorithms which may be disconcerting to parents and less experienced teachers. Too little student practice is included. There is an Algorithms Handbook in Grades 2-6 that provides pages that can be copied as a resource for bridging standard and non-standard algorithms. Student lessons assume an average of 90 minutes per period.

The series provides many resources – so many that a teacher can find lots of information and could get “lost” in the materials. There is a reference book for students but not a text book. Students have a Math workbook/ journal.

The Teacher’s Reference Manual is one of the best features of this series and would stand alone as a teacher resource to be used with any series. McGraw Hill provides a “5-Minute Math” resource for teachers to suggest activities to use in brief amounts of time – passing, waiting for transitions, etc. There is also a student game package that is a valuable stand-alone resource.

Prentice Hall Mathematics (6, 7 & 8)

Prentice Hall

2009

This text is not sufficiently challenging to support the AoD Curriculum Guidelines. It is supportive of teachers who don’t know the material well.

NOT RECOMMENDED

Math Expressions (K-8)

Houghton Mifflin Harcourt 2018

This series did not include rigorous enough problem sets or lessons to meet our archdiocesan standards. The vocabulary was not appropriate in the instructions for students. The lessons for lower grades were extremely abstract and did not seem appropriate for younger students' developmental stages. There were not any word problems in younger grades or application of concepts outside of numerical expressions. The older grade materials were the exact same print and format as the younger grades and did not seem mature enough for older students.

Investigations (K-5)

Pearson/Scott Foresman 2008

This series misses many of the objectives in our curriculum. It lacks practice examples or homework. It seems much more hands-on than other series and is very investigative. It lacks an "at home" reinforcement section. It is not designed to be used as a traditional text book. There is no table of contents. It lacks teacher support, was hard to follow the flow of the book, and did not differentiate well.

The directions for students were poor or lacking. The investigations aspect would be good as a supplement for a more mechanical approach.

Connected Math (6, 7 & 8)

Pearson/Prentice Hall

This series does not support the objectives in our curriculum and is far easier than our curriculum guidelines.